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CAN AGRO-FORESTRY CONTRIBUTE TO LIVELIHOODS OF PEOPLE? THE NEPALESE EXPERIENCE

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Abstract

Traditionally, Nepalese farmers have been growing trees, fuelwood and fruit trees on the bunds of terrace fields, marginal land and along the streams bank and raising animals. During the mid 70s different models of agroforestry such as Taungya system were developed and disseminated to reduce the pressure on the natural forests. However, agroforestry is still regarded as a means to reduce the dependency of people on natural forests and the resultant socio-economic benefits are often largely ignored. A study was undertaken in three western Terai districts of Nepal to find the incidence of agroforestry practices and their contributions to the livelihoods of the people. 150 farmers were interviewed in-depth and the practices they have been using to manage their farms were studied through participatory processes such as group discussions, transect walk, seasonality analysis etc.

This study shows that majority of the farmers are still unaware of many benefits of agro-forestry and majority of them have been practising agro-forestry simply to meet their demand of forestry products. The study reveals the absence of scientific management of agroforestry. Farmers give priority to crop management as compared to the tree management. While the District Forest Office is technically responsible for monitoring woody components, agroforestry has never been a priority program. Farmers have complains for both the quality and quantity of the services available through the government sector. Cash flow analysis of agroforestry models reflects that agroforestry have high return compared with agriculture crops and hence can be promoted as one of the most viable options for improving the livelihoods. However, this study has identified some of the crucial issues which need to be addressed for practicing agroforestry as a vehicle to improve the people's livelihoods and for the scientific management and expansion of the agroforestry systems in the country.

Introduction

In Nepal, agroforestry, the practice of integrating trees into farm systems to enhance agricultural production, is a traditional practice. However, it is regarded as a means to reduce the dependency of people on natural forests and its resultant socio-economic benefits are often largely ignored. And little efforts are made to assess the contribution of agro-forestry towards the livelihood as well as economic returns. The Study is an attempt to fill this gap by assessing the different agroforestry practices and their contribution to the livelihoods of people. With the brief review of the Nepalese agroforestry, the paper describes the existing situation of agroforestry practice in the western Terai of Nepal and assesses the different agroforestry options in relation to their contribution towards the improvements on the livelihoods of people.

Conducted in three western Terai districts of Nepal, namely Nawalparasi, Rupandehi and Kapilbastu, the study has used exploratory research design. The survey was conducted in two stages. At the first stage, it was attempted to find the incidence of agroforestry practices. In the second stage, detailed survey was carried out with farmers practising agroforestry to assess the extent of agroforestry practice and its contributions to the

livelihoods of the people. 150 farmers were interviewed and in-depth investigation was carried out to assess the way they had been managing their farms through participatory processes such as focus group discussions, transect walk, seasonality analysis etc.

Agroforestry in Nepalese Context

History of agroforestry

Agroforestry is not a new practice for farmers. Traditionally, they have been growing trees, fuelwood and fruit trees on the bunds of terrace fields, marginal lands and along the stream banks and raising animals. They have been integrating trees with their agriculture crops to meet their diverse need of the forest products as well as insurance to their agriculture crops. Of the several types of agroforestry, the most famous agroforestry practice is growing trees on farmland and homestead kitchen gardening.

Different models of agroforestry were developed and disseminated during the mid 70s to reduce the pressure on the natural forest. In 1976, Taungya system was introduced in Bara district of Nepal to tackle the encroachment problems. Later on, this system was adapted by Sagarnath Forestry Development Project (SFDP) to reforest the area. Encouraged with the success of SFDP, other projects too started to introduce agroforestry as one of the major components in their programme. In the mid 1980s, Terai Community Forestry Project introduced the agroforestry with intercropping in afforestation or plantation, which included the free distributions of the seedlings. This speeded up the expansion of agroforestry in Nepal, particularly in the Terai.

Agroforestry in Nepal's Farming System

Forest is the integral part of Nepalese farming system. Farmers depend heavily on forests for supply of fodder, fuelwood and construction materials. The pressure on natural resources or forest resources has increased by many folds due to rapid population growth, and lack of alternate livelihood opportunities over-exploitation of forest for fulfilling daily subsistence needs of forest products such as fuelwood, fodder, animal bedding and small timber. The improper land use system, heavy pressure on forest, improper cultivation practices are the main problems of these areas. Some specific problems which the farmers are facing these days are as follows:

- Dependency on natural forests for daily use needs like fuel wood, fodder and timber
- Declining productivity of the land as well as cultivation of traditional crops
- Diminishing wood and forest resources, which has led to an acute shortage of fuel wood and other essential wood products
- Large number of cattle population and poor productivity of the cattle
- Shortage of fodder sources for livestock
- Land degradation, both in terms of loss of fertility and aggravated erosion
- Lack of income and employment opportunities
- Fragmented land holdings

Above scenario suggests for the need to promote non-farm agroforestry to sustain rural livelihoods. Similarly, use of agricultural residues for cooking has substituted the demand of fuelwood and animal feed. Agroforestry as a multiple land use option for optimum biomass production per unit land can play an important role in fulfilling the demand of tree products and agricultural crops as well as in soil conservation.

Not only agroforestry supplements the tree products based demand of people but also it is one of the financially viable options of optimum land use. Kanel (1995) has reported that the share of the trees to the total net present value is 51%. Thus the scope of agroforestry is in increasing trend due to decrease in per capita land holding size and access to forests which are caused as a result of the rapid population growth, increasing poverty and declining of agricultural productivity.

Policies and Legal Environment

The paper reviews policy, periodic plans and legal framework of the forestry sector in Nepal with reference to private forestry and agroforestry to understand the commitments

of Government on the promotion of agroforestry. Nepalese policies and legislations have no special clauses or provisions related to the promotion of agroforestry, and it is included within the private forestry. Private forestry programme refers to trees on private agricultural or marginal land used to supplement animal fodder, fuelwood and other basic resources or simply to provide saleable produce. Since private forest refers to trees in small woodlots or trees integrated with agricultural crops as agroforestry, the policy and legislations related to private forestry can be applicable in context of agroforestry as well.

The Master Plan for the Forestry Sector, 1986 aims to meet the people's basic needs for fuelwood, fodder, timber, and other forest products and contribute to food production through encouraging people to establish tree farms on their uncultivated lands and by distributing of free or subsidized seedlings of desirable tree species. Similarly, the revised forest sector policy (2000) suggests to expand agroforestry techniques by inter-cropping of fruit trees with medicinal and aromatic plants as well as by other multiple land use techniques adapted to various farming system through effective interaction between forestry and farming practices. Likewise, the Agriculture Perspective Plan (APP) (1995-2015) urges the government to encourage farmers to commercialize farming operations on environmentally more robust lands in order to relieve pressure on limited natural resource base for achieving higher economic growth through improved productivity in agriculture. In addition, promotion of intercropping with medicinal herbs and other cash crops for providing economic benefits and generating off-farm employment to the rural poor has also been mentioned in the APP. The tenth five-year plan (2002-2007) also emphasizes the greater role of the forest resources in reducing poverty through various forest development activities. In order to achieve above objectives, the plan gives a priority to agroforestry programme.

For encouraging farmers to practise agroforestry, the Forest Act (1993) allows farmers to utilize, sell or distribute the forest products by fixing their price according to his/her will when they develop, conserve and manage the woodlots in their farm lands. For this, the District Forest Office is to provide necessary technical assistance.

Understanding Agroforestry Practice

Farmers practising agroforestry

For the purpose of the study, 150 households (HHs) from three districts were selected randomly to find incidence of farmer's practising agroforestry. Most of farmers (80%) reported that they are either having trees on their farm land or practising the agroforestry. The study reveals that number of trees per HH is 9.8. The number of trees per ha is 13.5 (Table 1) which is almost similar to Kanel's study which reported 11 trees per ha of cultivated land in the Terai. Of 1179 trees enumerated from the HH survey, 64.6% accounted for the Sisso (*Dalbergia sisso*) followed by Aam (*Mangifera indica*) (18.6%) and other tree species as reported in Table 3. The number of Sisso trees was quite high in the study area because Terai Community Forestry Project had promoted this species for tree planting by providing seedlings free of cost for on-farm planting. The average number of seedlings planted per HH was around 199 (Evans, 1989).

Table 1: Agroforestry in western Terai of Nepal

S No	Response	Attributes
1	No. of farmers practising agroforestry	120 (80%)
2	Total operated land (ha)	86.76
	Operated land per HH (ha)	0.72
2	Total number of trees	1179 (100%)
	• Sisso	762 (64.6%)
	• Mango	219 (18.6%)
	• Others	128 (16.8%)
3	No of trees per HH	9.8
4	Number of trees per ha	13.5
5	Place of plantation	
	• Khet land (irrigated)	59 (49.8 %)
	• Khet land (Unirrigated)	31 (25.8 %)
	• Waste land	27 (22.5 %)
	• Homestead land	24 (20.0 %)
	• Others	8 (6.7 %)

Of the total planted trees, about 50% are planted on the borders of “khet” land (irrigated land). This is consistent with Evan’s study, which reported 46% plantation in similar type of land.

Reasons for Initiating Agroforestry

Table 2 presents farmers’ perception for practising the agroforestry. Seventy two percent farmers reported that they practised agro-forestry to meet their demand of forestry products. This was followed by the support received from external agencies (50%) which refers to the free distribution of seedlings. This shows that majority of farmers are unaware of the resultant benefits of the agroforestry as the objective of agroforestry is to optimize production and economic returns per unit area, while respecting the principle of sustainable development.

Table 2: Reasons for practising agroforestry

S.N	Response	Number	Percent
1	Meet the demand of forest products	86	71.7
2	External support/free seedlings	60	50.0
3	Secure higher income	42	35.0
4	Multiple use of the land	27	22.5
5	Increase the productivity of land	17	14.2
6	Conserve the land and water	11	9.2
	Total	120	100.0

Note: Total does not tally due to multiple responses

Agroforestry models

As discussed earlier, agroforestry is a land use system that involves deliberate retention, introduction or mixture of trees or other woody perennials in crops/animal production to benefit from the resultant ecological and economic intersections (Nair, 1984). Based on the field observations and interactions with the farmers, the patterns of tree planting on farmland or agroforestry include following categories (LFP 2003)-

- Trees and agricultural crops;
- Trees and grass;
- Trees and Non-Timber Forest Products (NTFP);
- Trees planted around pond or fish pond;
- Trees on bund;

- Trees and crops in rows (Alley cropping);
- Scattered trees on farm land;
- Row or line plantation; and
- Block plantation.

The above categories can be broadly classified into three groups, trees planted in blocks, inter-cropping/agroforestry and trees on farmland.

Trees planted in blocks: Trees are planted in the block with poor soil conditions or even in patches of the farmland. The species planted were *Dalbergia sissoo*, *Mangifera indica*. Orchards of mango trees in the Terai farmlands are intercropped with agricultural crops. The crops grown under mango orchards are not reported. However, these orchards are also surrounded by one or two rows of *D. sissoo* and *Dendrocalamus strictus*. When the fruit yield declines, trees are felled for timber and fuelwood. The land is then cultivated for agricultural crops presumably for some time, and then reverted back to the orchard.

Intercropping / agroforestry: For intercropping between trees and crops farmers are practising different models as discussed below. The common agroforestry models found in the district are agri-silviculture (crops + tree); silvo-pastoral (trees + pasture); Agri-horticulture (Crops + fruit trees); Agri-silvi-pastoral (crop+fruit trees+ pasture); and homestead agroforestry (multiple combination of various components). The common species planted is *Dalbergia sissoo* and *Mangifera indica*. *D.sissoo* covers about 90% of the total trees on farm (LFP, 2003).

- **Crops in between tree rows** - Tree species (*Dalbergia sissoo*, *Mangifera indica*) are planted in rows and crops are grown in between them. The rows width varies from 10 to 20 meter which also serves as the farmer's field boundary in most of the case. The agriculture crops include paddy, wheat, lentil, pea etc.
- **Paired tree rows** - Trees are planted in the paired rows with the spacing between 1.5m x 1.5 m to 3m x 3m. The width of the space varies from 10 to 20 meters and the empty spaces between the rows are used for cropping. This system enables farmers to use mechanical /bullocks ploughing as well as helps them to grow crops for longer duration. The most common species planted are *Dalbergia sissoo* followed by *Mangifera indica*.
- **Silvofishery** - This is a system where trees are used in conjunction with fish farming. This system is currently gaining momentum in the Terai parts of the country where *Dalbergia sissoo* and other trees are being planted on the risers of the pond along with some banana, pineapple and papaya. In some cases, ducks and pigs are also included.
- **Trees and NTFPs** - Under this system the trees are used in conjunction with the NTFPs

Trees on farm land: The trees are grown without specific spacing and scattered along the farm. The crops are grown in the blank spaces. In this system, tree population is kept low to avoid shading of the crops. The common species planted on farm land are again *Dalbergia sissoo* and *Mangifera indica*. The list of species planted on farm land observed in this survey is given below in Table 3.

Table 3: Species reported under different agro-forestry systems

Species	Local	Major Use
<i>Albizia species</i>	Siris	Fodder, fuel
<i>Artocarpus lackoocha</i>	Badahar	Fodder, fruit
<i>Dalbergia sissoo</i>	Sissoo	Timber, fuel, fodder

<i>Eucalyptus camaldulensis</i>	Masala	Timber, fuel, oil
<i>Ficus semicordata</i>	Khanu	Fodder
<i>Leucaena leucocephala</i>	Ipil Ipil	Fuel, fodder
<i>Mangifera indica</i>	Amp	Fuel, timber, fruit
<i>Populus species</i>	Lahare peepal	Timber, fodder, fuel
<i>Sesbania grandiflora</i>	Dhaincha	Fodder, green manure

Management practices

Agroforestry system involves the close interaction of trees with crops, livestock or both. Hence, tree and agriculture crop management is essential for effective and efficient management of agroforestry. Similarly, different agroforestry models or systems need to be managed differently and management will depend upon the objectives of the agroforestry. The management of agroforestry begins with the selection of species, managing spacing between trees, protection, pruning and thinning etc. However, farmers give priority to crop management as compared to the tree management. This could be mainly because of long gestation period of forest crops, increasingly attack of disease in *Dalbergia sissoo* and less management support or assistance. Table 4 reflects that farmers are either unaware or have ignored the tree management aspects of agroforestry though they are giving due considerations in crop management. More than half of the farmers (58.3%) reported that the management of trees mainly included protection and use of forest products. One third (32.5%) of farmers reported that they were carrying out lopping and pruning operations for fuelwood, fodder and animal bedding materials as well as to reduce the shading effects on the crop. Very few farmers have informed to have applied fertilizer, irrigation etc. in the agroforestry. This reflects the lack of technical knowledge on agroforestry management. The application of insecticides and pesticides was high (32.5%) which was due to widespread of disease in *Dalbergia* trees.

Table 4: Management Practices

S No	Response	Number	Percent
A. Crop management			
1	Selection of crops	102	85.0
2	Weeding	108	90.0
3	Application of fertilizers, manures etc	112	93.3
4	Application of pesticides/insecticides	68	56.7
5	Intercropping	79	65.8
<i>Note: Total does not tally due to multiple response</i>			
B. Tree management			
1	None/ Left as it is (Use)	70	58.3
2	Soil working/weeding	18	15.0
3	Thinning	26	21.7
4	Pollarding	18	15.0
5	Pruning and lopping	39	32.5
6	Application of fertilizers, manures	17	14.2
7	Application of pesticides/insecticides	39	32.5
8	Protection from grazing, fire etc.	25	20.8
Total		120	100.0

Return from agroforestry system

It was extremely difficult to collect financial details of agroforestry as farmers could not provide necessary details. This in turn led to another important discussion, whether farmers recognize or realize financial benefits from the system. They hardly cared about species planted or on the financial returns from the trees. When asked about the return from the agroforestry, most common answers were as follows-

- How can I remember the value of the amount of fuelwood, fruits or fodder that I have collected and what I spent on them?
- What benefits did I get from this farm? It hardly provides food to feed my whole family?
- What economics! I will be happy if I could just return my costs?
- I'm just not able to recollect the exact amounts on yearly basis, but yes, I can certainly tell you what efforts I had to make at the time of planting.

Hence, cash flow analysis showing the flow of cash expenditures and receipts resulting from the introduction and maintenance of an agroforestry system was used to assess the return from the agroforestry system. Table 5 compares the return of agroforestry model for one ha of land. This analysis does not include the value of the standing trees because, it only attempts to calculate the annual benefits derived by the farmers under different agroforestry model. The highest ratio of benefits (2.84) has been found for the silvo-fishery practice because farmers are getting multiple benefits from it such as pigs raising, duck farming, banana cultivation, fishery and along with fodder and fuelwood and that too in a short duration of time, i.e. within a year.

Table 5: Cost and Benefits of different agroforestry models

S.No.	Models / practice	Cost (Rs)	Return (Rs)	Benefit cost ratio
1	Trees with cereal crops	13,689	26,715	1.95
2	Trees with horticulture crops	14,315	35,512	2.48
3	Fruit trees with cereal crops	13,456	29,319	2.18
4	Fruit trees with vegetables	15,619	42,689	2.73
5	Trees scattered on farm land	11,110	20,989	1.89
6	Silvo-fishery	19,236	54,653	2.84

Remark: Benefits were calculated without valuing the standing tree

This model can be promoted as one of the most viable options for improving the livelihoods as majority of the farmers have either their own or public ponds in their vicinity. Similarly the combination of fruit trees with vegetable cultivation also yielded high benefits to farmers since they can get regular income. Though most of the farmers have planted trees on their farm land, benefit cost ratio was low compared with the other models. This was mainly because trees were planted for their subsistence use and farmers often ignored the return from woody components. However, the return was high compared to the agriculture crops alone as shown in Table 6.

Table 6: Comparative advantage of agroforestry compared with agriculture crop

Particulars	Agriculture		Agroforestry	
	Expense	Income	Expense	Income
Cost of cultivations	12,215		11,726	10,202
Return from crops		21,021		15,555
Management of tree			3,021	
Tree products				4,721
Value of sanding tree				37,450
Total expense (Rs)	12,215	21,021	14,747	67,929
Return from agroforestry	1.72		4.61	

Remark: Value to standing tree is estimated at market price of current year

Problems faced

When respondent farmers were asked about the problems that they had been facing in management of the agroforestry farms, majority of them (72.7%) mentioned lack of technical knowledge as their main problem followed by the management assistance from the concerned agencies (Table 7). Though District Forest Office is responsible for

monitoring woody components, agroforestry has never been a priority program of the DFO. Farmers have complaints for both quality and quantity of the services available through the DFO. The other problems faced by farmers in managing and developing the agroforestry includes dead and dying of *Sissoo* trees, training and extension support, lack of management assistance, marketing problems of the products, knowledge about policies, acts and regulations etc.

Table 7: Problems faced by agroforestry farmers

S No	Response	Number	Percent
1	Lack of technical knowledge	86	71.7
2	Dead and dying of <i>sissoo</i> trees	71	59.2
3	Training and extension support	68	56.7
4	Lack of management assistance	59	49.2
5	Marketing problems of the products	39	32.5
6	Dying of trees in plantation	31	25.8
7	Knowledge about policies, acts and regulations	23	19.2
8	Taxation on forest products	17	14.2
9	Lack of irrigation, particularly for vegetable crops	17	14.2
10	Limited opportunities for forest enterprises	16	13.3
11	Lack of quality and appropriate species	12	10.0
12	Legal complications and formalities	9	7.5

Impacts of agroforestry

The agroforestry is economically and financially viable option of optimum use of land. The comparative analysis of agriculture and agroforestry in one ha of land has been presented in Table 6. The table reflects that return of agriculture is 1.72 where as that of agroforestry is 4.61 which is almost double. Hence, agroforestry may not only reduce pressure on natural forests but also supports farmers to raise additional income through the management of same unit of land.

Table 8: Impacts of agroforestry

Impacts	Increase	Similar	Decrease	Total (N = 120)
Crop production	17.5	26.7	55.8	100.0
Fruit production	45.8	38.3	15.8	100.0
Sufficiency in forest products	76.7	20.8	2.5	100.0
Time spent on collection of forest products	5.8	23.3	70.8	100.0
Number of livestock	24.2	53.3	22.5	100.0
Productivity of livestock	60.8	22.5	16.7	100.0
Income	74.2	20.0	5.8	100.0
Soil conditions/fertility	18.3	64.2	17.5	100.0
Soil Erosion	14.2	46.7	39.2	100.0

The impact and implication of agroforestry on livelihoods is assessed in terms of production of crops, fruits, self sufficiency on fodder and fuelwood, reduction of time in collection of forest products, generation of income and other benefits from agroforestry, no of livestock and its productivity. Table 8 summarizes impacts of agroforestry. 55.8% farmers felt that crop production had decreased after agroforestry as a result of shading effect or competition for nutrients where as 45.8 farmers considered that increase in fruit production was due to improved soil fertility, use of improved seeds or seedlings along

with upgraded knowledge and skills of agroforestry practices. Majority of the farmers (76.5%) credited agroforestry for helping them to achieve self sufficiency on fuelwood/fodder due to different silviculture operations carried out in the woodlots. According to the farmers (70.8%), agroforestry has significantly contributed to reduction in the time in collection of forest products. Although 53 % respondents informed that number of livestock has remained nearly the same, about 61% confirmed increase in productivity of their livestock due to availability of highly nutritious fodder and palatable species at farm itself. Majority of the farmers (74.2%) reported that their income had increased from agroforestry as their income source had been diversified. Farmers have mixed perceptions on impacts of agroforestry on soil conservation and soil fertility as they were not able to measure any tangible benefits from it despite a few reported increase in production of crops as a result of agroforestry.

Lessons Learnt

As stated earlier, Nepal's forestry sector policies and periodic plans have identified agroforestry as one of the best options to enhance livelihood opportunities and reduce the dependency on natural forests. However, adaptation and application of agroforestry has not taken place as expected. The study shows that farmers were not able to perceive actual benefits of agroforestry. These are mainly due to weak research and development in agroforestry, lack of awareness among farmers, traditional beliefs and poor market linkages and coordination. Except free distribution of seedlings, there seems very little promotional activities on agroforestry techniques. Extension services are practically absent at the moment.

The farmers have planted tree species because they got free seedlings or to meet demand of forest products though it has complementary relationships on natural resource base as well as on productivity of land.

Farmers are not able to harness the benefits of agroforestry due to lack of technical skills and management assistance required as well. Though, District Forest Offices are responsible for monitoring woody components, agroforestry has never been their priority program. Farmers have complaints with regard to both the quantity and quality of the services provided by them.

The study also reveals the absence of scientific management of agroforestry. The management of agroforestry includes mainly protection and use. The lopping and pruning operations are carried out for fuelwood, fodder and animal bedding materials. Very few farmers apply fertilizer, irrigation and herbicides in the agroforestry. Whenever, they prepare fields for seasonal cultivation, management of woody components gets due care.

Agroforestry is not simply mixing of a few trees and crops. For promoting viable agroforestry system, understanding tree-crop interaction and its relationships is crucial. But this has not received priority from both the farmers and the development practitioners. Scarce resources need to be allocated in the right way.

Agroforestry is still at a very rudimentary stage in the country. An appropriate and properly managed species mix will bring about the sustainable land use system. Lessons learnt from the Terai community forestry have also indicated for appropriate documentation of agroforestry system.

ISSUES AND ACTIONS

The study has identified the following crucial issues which need to be addressed for practising agroforestry as a vehicle to improve the people's livelihoods as well as for the scientific management and expansion of the agroforestry system in the country.

- **Induced vs. need based:** In the past, expansion of the agroforestry system did little to understand farmers' needs and priorities. Species were identified and introduced in localities without detailed understanding of local situations. For sustainability of the system and enabling farmers to diversify their income, agroforestry system should cater to farmers' needs and their priorities. As a prelude to promoting agroforestry, it is necessary to investigate opportunities for management of resources which fit in with the local situations and culture.
- **Promotion vs. management assistance:** The purpose of the agroforestry should be to assist farmers to manage their lands to meet management objectives through educational and technical support rather than forcing or encouraging them for agroforestry through incentives or any other benefits such as tax exemption. The resource centers might be established to share information as well as for disseminating different extension materials. Credit and insurance facilities must be available to farmers and linkages should be established with bank, forest based industries and other money lending institutions.
- **Incentive vs. capacity development:** Past efforts concentrated on push strategy of agroforestry and provided incentives such as free seedlings, subsidies etc. and did little to develop human skills and capabilities required for the management. As sought by many farmers, capacity development should prevail over incentive system to push the agroforestry system. Incentive system is not sustainable.
- **Technical package vs. technical support:** Considering the different site conditions and needs of the farmers, it will not be possible to develop a model or provide same technical packages applicable to all the farmers. Hence, educational and technical support must be provided to farmers interested in agroforestry for multiple use and benefits as to their management objectives. Potential service provider should be identified for the development of agroforestry for having comparative advantage and complementary in delivering the services.
- **Adoptive vs. adaptive approach:** In the past, agroforestry models were developed and disseminated without detailed understanding of the local situations and conditions. Hence the focus should be on identification and documentation of effective, efficient and potential agroforestry practices which not only fit in with the needs of the farmers but also are compatible with their farming system. Demonstration plots for different management objectives (Farmers' Field School) should be established so that results of different management objectives can be seen and replicated in other areas as well.
- **Land use vs. landscape:** The purpose of the agroforestry should be to increase the number of trees in the landscape to meet the demands of the forest products and not changing the land use patterns.
- **Subsistence vs. market oriented approach:** Earlier main purpose of agroforestry development was to meet household demand of forest products. As a result, market assistance and market linkage development were amongst the most neglected components. However, management of agroforestry is likely to be unsustainable if due attention on marketing aspects is not given. Thus, marketing assistance is required to provide practical marketing assistance to farmers by providing information related to market trends and conditions, current prices, marketing methods, logging and grading of timber and establishing institutional linkages with the forest based industries.

- **Unilateral vs. coordinated efforts:** Agroforestry does not mean cultivation of crops and trees together but it is concerned with interactions between trees and crops. Therefore neither forestry nor agriculture department can alone contribute to the development or promotion of the agroforestry. Hence close collaboration and coordination among district line agencies such as District Agriculture Development Office, District Forest Office, District Livestock Development Office, District Soil Conservation Office and District Small Enterprise Development Office is necessary.

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